8 - 18 GHz Low Noise Amplifier

Features

- Frequency Range : 8.0 – 18.0GHz
- Better than 2.4 dB noise figure
- 23 dB Nominal gain
- 12 dBm min. P1 dB
- Input Return Loss > 10 dB
- Output Return Loss > 10 dB
- Single supply operation
- No external matching required
- DC decoupled input and output
- 0.15 µm InGaAs pHEMT Technology
- Chip dimension: 2.5 x 1.5 x 0.1 mm

Typical Applications

- Radar
- Military
- Test equipment and sensors

Description

The AMT2152011 is a Low Noise Amplifier operating in 8.0 – 18.0 GHz frequency range. The LNA uses 3 stages of amplification and provides 23 dB of gain with an impressive mid-band noise figure of 1.5 dB and a maximum NF of 2.4 dB at 8 GHz. The amplifier exhibits a good match over the entire band with typical input and output return losses better than 10 dB. The LNA has a minimum P1 dB of 12 dBm. The amplifier operates on a single +3V DC supply. The Circuits grounds on the die are provided through vias to the backside metallization. The die is fabricated using a reliable 0.15µm pHEMT technology.

Absolute Maximum Ratings\(^{(1)}\)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Absolute Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive DC voltage</td>
<td>+6</td>
<td>V</td>
</tr>
<tr>
<td>RF input power</td>
<td>+15</td>
<td>dBm</td>
</tr>
<tr>
<td>Supply Current</td>
<td>150</td>
<td>mA</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-55 to +85</td>
<td>°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-65 to +150</td>
<td>°C</td>
</tr>
</tbody>
</table>

1. Operation beyond these limits may cause permanent damage to the component
Electrical Specifications @ $T_A = 25^\circ C$, $Z_0 = 50\Omega$; $V_{d1} = V_{d2} = V_{d3} = 3V$

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Value</th>
<th>Value</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Range</td>
<td>8.0 – 12.0</td>
<td>12.0 – 16.0</td>
<td>16.0 – 18.0</td>
<td>GHz</td>
</tr>
<tr>
<td>Gain</td>
<td>24.5</td>
<td>23.0</td>
<td>20.0</td>
<td>dB</td>
</tr>
<tr>
<td>Gain Flatness</td>
<td>± 0.5</td>
<td>± 1.4</td>
<td>± 0.7</td>
<td>dB</td>
</tr>
<tr>
<td>Noise Figure (max.)</td>
<td>2.4.</td>
<td>2.0</td>
<td>2.4</td>
<td>dB</td>
</tr>
<tr>
<td>Input Return Loss (min.)</td>
<td>10</td>
<td>9</td>
<td>8.</td>
<td>dB</td>
</tr>
<tr>
<td>Output Return Loss (min.)</td>
<td>9</td>
<td>10</td>
<td>10</td>
<td>dB</td>
</tr>
<tr>
<td>Output Power (P1 dB) (min.)</td>
<td>11.</td>
<td>11</td>
<td>11</td>
<td>dBm</td>
</tr>
<tr>
<td>Saturated output power (Psat)</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>dBm</td>
</tr>
<tr>
<td>Output Third Order Intercept (IP3)</td>
<td>22</td>
<td>22</td>
<td>22</td>
<td>dBm</td>
</tr>
<tr>
<td>Supply Current</td>
<td>95</td>
<td></td>
<td></td>
<td>mA</td>
</tr>
</tbody>
</table>

**Note:**

1. Electrical specifications as measured in a test fixture.
Test fixture data

\( V_d1 = V_d2 = V_d3 = 3V, \) Total Current = 95 mA, \( T_A = 25 \, ^\circ C \)

![Gain vs Frequency](image1)

![Noise figure](image2)

![I/O Return Losses](image3)
Test fixture data

\[ V_{d1} = V_{d2} = V_{d3} = 3V, \text{ Total Current} = 95 \text{ mA, } T_A = 25 \text{ °C} \]

**Gain compression at 8 GHz**

-30 dBm
24.9 dB

P1 dB = 12.4 dBm

**Gain compression at 13 GHz**

-30 dBm
23.5 dB

-7.3 dBm
23.5 dB

P1 dB = 15.2 dBm

**Gain compression at 18 GHz**

-30 dBm
20 dB

-5.2 dBm
19 dB

P1 dB = 13.8 dBm
Mechanical Characteristics

Units: millimeters (inches)
All RF and DC bond pads are 100µm x 100µm

Note:
1. Pad no. 8: Vd1
2. Pad no. 6: Vd2
3. Pad no. 5: Vd3
4. Pad no. 3: RF out
5. Pad no. 1: RF in
Die attach: For Epoxy attachment, use of a two-component conductive epoxy is recommended. An epoxy fillet should be visible around the total die periphery. If Eutectic attachment is preferred, use of fluxless AuSn (80/20) 1-2 mil thick preform solder is recommended. Use of AuGe preform should be strictly avoided.

Wire bonding: For DC pad connections use either ball or wedge bonds. For best RF performance, use of 150 - 200µm length of wedge bonds is advised. Single Ball bonds of 250-300µm though acceptable, may cause a deviation in RF performance.

GaAs MMIC devices are susceptible to Electrostatic discharge. Proper precautions should be observed during handling, assembly & testing.